(e) ISSN Online: 2321-9599
(p) ISSN Print: 2348-6805

ORIGINAL ARTICLE

EFFECT OF ADIPOSITY ON THE CARDIOVASCULAR FITNESS OF DIABETIC PATIENTS

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ABSTRACT:
Background: In both industrial and developing nations, excess food intake and physical inactivity underlie the growing worldwide epidemic of obesity. A direct association of visceral fat accumulation can be postulated with the development of cardiovascular disease. There exists a strong relationship between adiposity, risk of insulin resistance and development of cardiovascular diseases. Hence; we conducted the present study to ass the effect of adiposity on the cardiovascular fitness of the diabetic patients. **Materials & methods:** The present study was conducted in the department of physiology and medicine and included assessment of 233 patients who were diagnosed with type 1 diabetes. The following data were collected: demographic details (ethnicity, place and date of birth, sex), height, weight, duration of diabetes, waist circumference (WC), systolic/ diastolic blood pressure (SBP/DBP), glycated hemoglobin (HbA1c) (with normal reference ranges), triglycerides (TG), HDL cholesterol, current insulin therapy, other medical therapies. The mean of four HbA1c determinations during the previous year (HbA1cyear) was considered for each patient; all the HbA1c values provided from different centres were mathematically standardized to the DCCT normal range (4.05– 6.05%). All the results were analyzed by SPSS software. **Results:** Mean age of male and females patients was 30.5 and 32.1 years. Mean duration of diabetes among males and females was 7.9 and 8.8 years respectively. Mean BMI of the male and females was 22.5 and 24.3 kg/m^2 respectively. Significant results were observed while comparing the mean height of the patients, mean weight of the patients and mean systolic blood pressure among males and females respectively. **Conclusion:** Particularly in female patients with diabetes, more emphasis should be given to the adiposity as it is have some amount of effect on cardiovascular fitness.
Key words: Adiposity, Cardiovascular, Diabetes

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This article may be cited as: Sodhi HS, Singh M. Effect of adiposity on the cardiovascular fitness of diabetic patients. J Adv Med Dent Scie Res 2016;4(6):195-198.

Access this article online	
Quick Response Code	Website: www.jamdsr.com
	DOI: 10.21276/jamdsr.2016.4.6.47

INTRODUCTION

In both industrial and developing nations, excess food intake and physical inactivity underlie the growing worldwide epidemic of obesity.[1] A variety of common disorders, eg, hyperglycemia, hyperlipidemia, and hypertension, are common in obese individuals.[2] Such disorders are not clustered coincidently, and intra-abdominal visceral adiposity has been suggested to play a fundamental role in the simultaneous development of these disorders, collectively termed the metabolic syndrome. In addition, one of the major challenges of this syndrome is the high prevalence of cardiovascular diseases arising from atherosclerosis.[3, 4] A direct association of visceral fat accumulation can be postulated with the development of cardiovascular disease. Epidemiological studies have suggested that visceral adiposity, as evaluated by the waist-to-hip ratio or computed tomography scanning, is related to coronary artery disease independently of body mass index.[5] There exists a strong relationship between adiposity, risk of insulin resistance and development of cardiovascular diseases.[6] Hence; we conducted the present study to ass the effect of adiposity on the cardiovascular fitness of the diabetic patients.

MATERIALS & METHODS

The present study was conducted in the department of physiology and medicine and included assessment of 233 patients who were diagnosed with type 1 diabetes. Inclusion criteria for the presented included:

- Patients with age between 22 to 50 years of age
- Patients with duration of diabetes of more than 24 months
- Patients without the history of any other systemic illness

- Patients without any known drug allergy
- Patients undergoing specific treatment for dyslipidemia or hypertension

Ethical approval was taken from institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. The following data were collected: demographic details (ethnicity, place and date of birth, sex), height, weight, duration of diabetes, waist circumference (WC), systolic/ diastolic blood pressure (SBP/DBP), glycated hemoglobin (HbA1c) (with normal reference ranges), triglycerides (TG), HDL cholesterol, current insulin therapy, other medical therapies. Their baseline characteristics (sex, age, diabetes duration, BMI, HbA1c and insulin dose) did not differ from the study population (data not shown). Measurements Body weight was determined to the nearest 0.5 kg on standard physician's beam scales, with the subject wearing only underwear and no shoes. Height was measured to the nearest 0.5 cm on standardized, wall-mounted height boards. The BMI was calculated (weight/height^2). WC was measured to the nearest centimeter with a flexible steeltape measure while the subjects were standing, after gently exhaling, as the minimal circumference measurable on the horizontal plane between the lowest portion of the rib cage and iliac crest. Blood pressure (BP) was measured by trained personnel, according to a standardized protocol.[6] Briefly, BP was taken on the left arm with the subject sitting, using an aneroid sphygmomanometer; the cuff had bladder long enough to encircle at least one-half of the upper arm without overlapping and widths that covered at least two-thirds of the upper arm. The mean of four HbA1c determinations during the previous year (HbA1cyear) was considered for each patient; all the HbA1c values provided from different centres were mathematically standardized to the DCCT normal range (4.05– 6.05%). All the results were analyzed by SPSS software. Chi-square test and student t test was used for the assessment of level of significance.

RESULTS

Table 1 shows the clinical details of the patients with diabetes. Mean age of male and females patients was 30.5 and 32.1 years. Mean duration of diabetes among males and females was 7.9 and 8.8 years respectively. Mean BMI of the male and females was 22.5 and 24.3 kg/m^2 respectively. Significant results were observed while comparing the mean height of the patients, mean weight of the patients and mean systolic blood pressure among males and females respectively. **Graph 1** shows the clinical details of the patients with diabetes. **Table 2** shows incidence of cardiovascular risk factors in type 1 diabetes mellitus patients. 21.8% and 6.1% of the males and females had waist size of more than 95 cm and 81 respectively. Significant results were obtained while comparing the percentage of the male and females patients while comparing the mean waist and systolic blood pressure respectively. **Graph 2** shows the incidence of cardiovascular risk factors in type 1 diabetes mellitus patients.

Table 1: Clinical details of the patients with diabetes

Parameter	Total patients (233)	Males (125)	Females (108)	p-value
Mean age (years)	31.0	30.5	32.1	0.21
Mean duration of diabetes (years)	8.6	7.9	8.8	0.25
Mean height (cm)	170.8	175.2	160.8	0.02*
Mean BMI (Kg/m^2)	24.0	22.5	24.3	0.81
Mean weight (Kg)	66.8	70.1	59.8	0.03*
Systolic blood pressure (mm of Hg)	118.2	122.1	112.8	0.03*
Diastolic blood pressure (mm of Hg)	72.1	71.9	68.4	0.88
Triglycerides (mmol/l)	0.89	0.89	0.83	0.71

*: Significant

Graph 1: Clinical details of the patients with diabetes

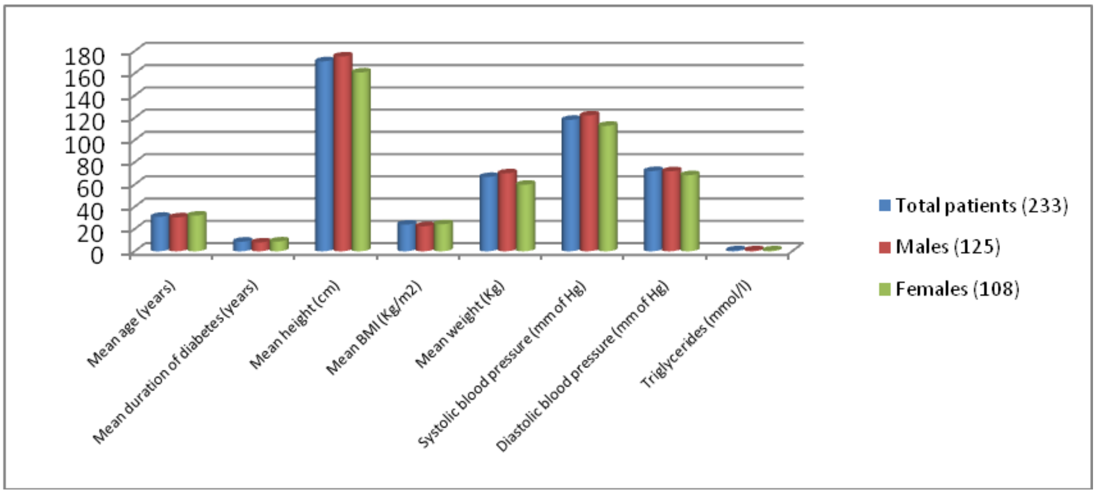
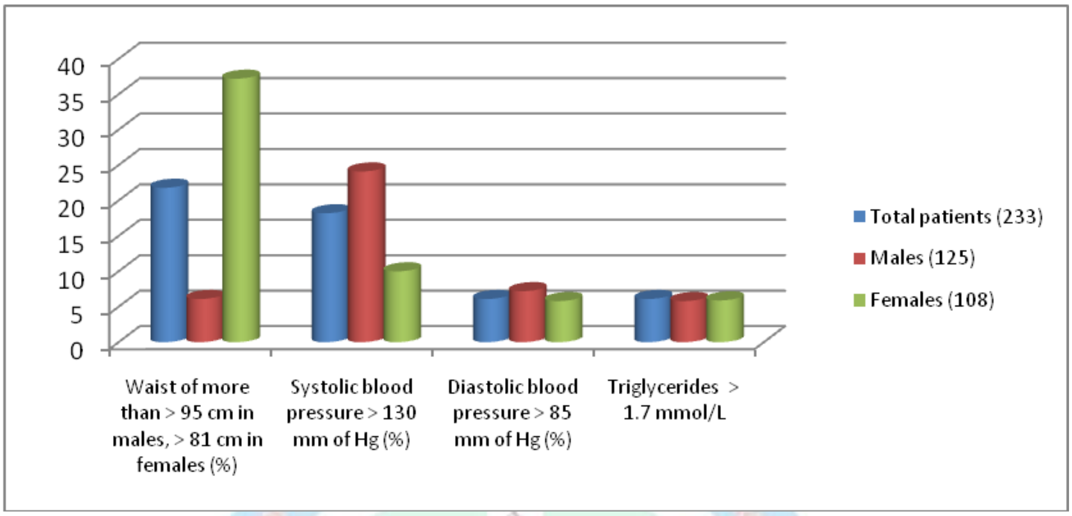


Table 2: Incidence of cardiovascular risk factors in type 1 diabetes mellitus patients

Parameter	Total patients (233)	Males (125)	Females (108)	p-value
Waist of more than $\geq$ 95 cm in males, $\geq$ 81 cm in females (%)	21.8	6.1	37.2	0.01*
Systolic blood pressure $\geq$ 130 mm of Hg (%)	18.2	24.1	10.0	0.02*
Diastolic blood pressure $\geq$ 85 mm of Hg (%)	6.1	7.2	5.8	0.50
Triglycerides $\geq$ 1.7 mmol/L	6.1	5.8	5.9	0.88

*: Significant

Graph 2: Incidence of cardiovascular risk factors in type 1 diabetes mellitus patients



DISCUSSION

Obesity is a well-known risk factor for type-2 Diabetes Mellitus (DM) and Cardiovascular Disease (CVD), and the fat accumulated on the abdominal region is strongly associated with both conditions.[7-9] Some of these visceral adiposity measurements have been evaluated among specific populations, but the results regarding type-2 diabetes and cardiovascular risk are inconclusive.[10] Hence; we conducted the present study to ass the effect of adiposity on the cardiovascular fitness of the diabetic patients.

In the present study we observed that abdominal obesity in females and hypertension in males was the most frequent cardiovnvascular risk factors (**Table 1, 2**). Fall et al used a Mendelian randomization approach, applying a set of 32 genetic markers to estimate the causal effect of adiposity on blood pressure, glycemic indices, circulating lipid levels, and markers of inflammation and liver disease in up to 67,553 individuals. All analyses were stratified by age and sex. The genetic score was associated with BMI in both nonstratified analysis and stratified analyses. They found evidence of a causal effect of adiposity on blood pressure, fasting levels of insulin, C-reactive protein, interleukin-6, HDL cholesterol, and triglycerides in a nonstratified analysis and in the <55-year stratum. Further, we found evidence of a smaller causal effect on total cholesterol in the ≥55-year stratum than in the <55-year stratum, a finding that could be explained by biology, survival bias, or differential medication. In conclusion, this study extends previous knowledge of the effects of adiposity by providing sex- and age-specific causal estimates on cardiovascular risk factors.[11] Haffner et al measured BP, lipids and lipoproteins, HDL subfractions, and insulin and glucose concentrations as part of the San Antonio Heart Study, a population-based study of diabetes and cardiovascular risk factors. Insulinemia and glycemia were assessed as the sum of the fasting, half-hour, one-hour, and two-hour insulin and glucose levels, respectively, measured during a standardized oral glucose tolerance test. By contrast, WHR continued to be inversely related to total HDL and HDL2 cholesterol even after adjustment for glycemia and insulinemia. Hyperinsulinemia was only weakly related to HDL cholesterol. These results suggested that insulinemia and glycemia might mediate the effects of upper body adiposity on TG, although not on HDL and HDL2 cholesterol. Hyperinsulinemia was also positively associated with diastolic and systolic BP in men.[12] Valerio et al analyzed the prevalence of abdominal adiposity and other traditional risk factors for cardiovascular disease in a large sample of Italian adolescents with type 1 diabetes mellitus (T1DM). T1DM adolescents (n=412 age: 17.3 ± 0.9 years) were enrolled from 18 clinical centres. Anthropometric and laboratory parameters, blood pressure and data on insulin treatment were registered. Metabolic syndrome (MetSy) was defined according to the International Diabetes Federation criteria. Abdominal obesity was the most common risk factor (20.1%) in females, while hypertension in males (25.1%). MetSy was found in 9.5% patients, predominantly in females. Patients with MeSy exhibited higher insulin requirement per body surface area and higher glycated hemoglobin than patients without MetSy. Overweight/obese patients had a much higher prevalence of MetSy than normal weight patients. Cardio-metabolic risk factors were assessed in a sample of 300 abdominally obese volunteers (233 females, 67 males, mean age 43.7 years) who were not being treated for diabetes, hypertension or dyslipidemia. In all, 53% had metabolic syndrome and only 16% were free of cardio-metabolic abnormalities. In order of importance, diastolic blood pressure (DBP), high-density lipoprotein cholesterol (HDL), and triglycerides (TGs) were most strongly associated with greater clustering of risk factors, with a one standard deviation difference being associated with a respective difference of 9.65, 1.23, and 0.12 in the number of risk factors present. A greater number of risk factors was associated with an increased derangement for any given risk factor, with this effect being greatest for dyslipidemia, as represented by the TG:HDL ratio. In abdominally obese individuals, DBP was strongly associated with metabolic syndrome component clustering, which may reflect the pathogenic progression of metabolic syndrome, as DBP is likely to be elevated following establishment of other risk factors. Also, dyslipidemia was strongly related to the magnitude of derangement of cardio-metabolic risk factors which may indicate that increases in dyslipidemia may drive the pathogenic progression of metabolic syndrome once acquire.[14]

CONCLUSION

From the above results, the authors concluded that particularly in female patients with diabetes, more emphasis should be given to the adiposity as it is has some amount of effect on cardiovascular fitness. Future studies are recommended.

REFERNCES

1. Wakabayashi I.. Relationships of body mass index with blood pressure and serum cholesterol concentrations at different ages. Aging Clin Exp Res 2004;16:461–466
2. Wakabayashi I, Daimon T.. Age-dependent decline of association between obesity and hyperglycemia in men and women. Diabetes Care 2012;35:175–177 .
3. Berrington de Gonzalez A, Hartge P, Cerhan JR, et al. . Body-mass index and mortality among 1.46 million white adults. N Engl J Med 2010;363:2211–2219.
4. Speliotes EK, Willer CJ, Berndt SI, et al. .; MAGIC; Procardis Consortium .. Association analyses of 249,796 individuals reveal 18 new loci associated with body mass index. Nat Genet 2010;42:937–948
5. 20. de Bakker PI, Ferreira MA, Jia X, Neale BM, Raychaudhuri S, Voight BF.. Practical aspects of imputation-driven meta-analysis of genome-wide association studies. Hum Mol Genet 2008;17:R122–R128
6. Palmer TM, Sterne JA, Harbord RM, et al. . Instrumental variable estimation of causal risk ratios and causal odds ratios in Mendelian randomization analyses. Am J Epidemiol 2011;173:1392–1403
7. Benjamini Y, Hochberg Y. Controlling the false discovery rate—a practical and powerful approach to multiple testing. J R Stat Soc Series B Stat Methodol 1995;57:289–300
8. Makki K, Froguel P, Wolowczuk I. Adipose tissue in obesity-related inflammation and insulin resistance: cells, cytokines, and chemokines. ISRN Inflamm 2013;2013:139239.
9. Ouchi N, Parker JL, Lugus JJ, Walsh K.. Adipokines in inflammation and metabolic disease. Nat Rev Immunol 2011;11:85–97
10. Gao H, Fall T, van Dam RM, et al. . Evidence of a causal relationship between adiponectin levels and insulin sensitivity: a Mendelian randomization study. Diabetes 2013;62:1338–1344.
11. Landsberg L, Aronne LJ, Beilin LJ, et al. . Obesity-related hypertension: pathogenesis, cardiovascular risk, and treatment: a position paper of The Obesity Society and the American Society of Hypertension. J Clin Hypertens (Greenwich) 2013;15:14–33.
12. Pikilidou MI, Scuteri A, Morrell C, Lakatta EG.. The burden of obesity on blood pressure is reduced in older persons: the SardiNIA study. Obesity (Silver Spring) 2013;21:E10–E13
13. Whitlock G, Lewington S, Sherliker P, et al. .; Prospective Studies Collaboration .. Body-mass index and cause-specific mortality in 900 000 adults: collaborative analyses of 57 prospective studies. Lancet2009;373:1083–1096.
14. Chen Y, Rennie DC, Reeder BA.. Age-related association between body mass index and blood pressure: the Humboldt Study. Int J Obes Relat Metab Disord 1995;19:825–831.

Source of support: Nil **Conflict of interest:** None declared